

**WHAT IS CLAIMED IS:**

- 1                   1.       A prosthetic heart valve resistant to tissue overgrowth following  
2       implantation of said prosthetic heart valve into a host, said heart valve comprising a  
3       sewing ring, and a housing component enclosing a valve component, wherein a member  
4       selected from said sewing ring, said housing component, said valve component and  
5       combinations thereof comprises at least one biologically active material in an amount  
6       sufficient to prevent tissue overgrowth.
- 1                   2.       The heart valve according to claim 1, wherein said sewing ring  
2       comprises said at least one biologically active material.
- 1                   3.       The heart valve according to claim 1, wherein said sewing ring  
2       comprises a polymeric material.
- 1                   4.       The heart valve according to claim 3, wherein said polymeric  
2       material comprises a member selected from plastics, rubbers and combinations thereof.
- 1                   5.       The heart valve according to claim 3, wherein said polymeric  
2       material is a fabric.
- 1                   6.       The heart valve according to claim 5, wherein said fabric  
2       comprises a material that is a member selected from thermoplastic polyurethanes TPUs,  
3       nylons, polypropylene, polytetrafluoroethylene, polyesters, nylon polymers, block  
4       copolymers of a polyether polymer and a polyester polymer, and block copolymers of a  
5       polyether polyol and one selected from the group consisting of polyamides, polyimides,  
6       polyolefins, synthetic hydrocarbon elastomers, and natural rubber.
- 1                   7.       The heart valve according to claim 5, wherein said polyester is  
2       polyethylene terephthalate (PET).
- 1                   8.       The heart valve according to claim 5, wherein said nylon is a  
2       member selected from nylon-11, nylon-12 and combinations thereof.
- 1                   9.       The heart valve according to claim 5 wherein said polyolefin is a  
2       member selected from polyethylenes (PE) and polypropylenes (PP).

1                   10.     The heart valve according to claim 5, wherein said fabric is a  
2 member selected from a weft knit with a velour, a weft knit without a velour, a warp knit  
3 with a velour, a warp knit without a velour, a weave structure with a velour, a weave  
4 structure without a velour and combinations thereof.

1                   11.     The heart valve according to claim 10, wherein said fabric  
2 comprises a combination yarn comprising at least two polymeric components.

1                   12.     The heart valve according to claim 11, wherein said combination  
2 yarn comprises polyester wrapped with polypropylene yarn.

1                   13.     The heart valve according to claim 1, wherein said at least one  
2 biologically active material is a member selected from antithrombotics,  
3 antiinflammatories, corticosteroids, antimicrotubule agents, antisense oligonucleotides,  
4 antineoplaastics, antioxidants, antiplatelets, calcium channel blockers, converting enzyme  
5 inhibitors, cytokine inhibitors, growth factors, growth factor inhibitors, growth factor  
6 sequestering agents, immunosuppressives, tissue factor inhibitor, smooth muscle  
7 inhibitors, organoselenium compounds, retinoic acid, retinoid compounds, sulfated  
8 proteoglycans, NO, NO precursors and combinations thereof.

1                   14.     The heart valve according to claim 13, wherein said antithrombotic  
2 is a member selected from heparin, heparin derivatives, hirudin, hirudin derivatives and  
3 combinations thereof.

1                   15.     The heart valve according to claim 13, wherein said corticosteroid  
2 is a member selected from dexamethasone, dexamethasone derivatives and combinations  
3 thereof.

1                   16.     The heart valve according to claim 13, wherein said  
2 antimicrotubule agent is a member selected from taxane, taxane derivatives and  
3 combinations thereof.

1                   17.     The heart valve according to claim 13, wherein said antiplatelet  
2 agent is an inhibitor of collagen synthesis.

1                   **18.**     The heart valve according to claim 17, wherein said inhibitor of  
2 collagen synthesis is a member selected from halofuginore, halofuginore derivatives,  
3 GpII<sub>b</sub>III<sub>a</sub> and combinations thereof.

1                   **19.**     The heart valve according to claim 1, wherein said biologically  
2 active material adheres tenaciously, without covalent bonding, to a member selected from  
3 said sewing ring, said housing component, said valve component and combinations  
4 thereof.

1                   **20.**     The heart valve according to claim 19, wherein said sewing ring  
2 comprises said biologically active material.

1                   **21.**     The heart valve according to claim 19, wherein said biologically  
2 active material is combined with a surfactant.

1                   **22.**     The heart valve according to claim 21, wherein said surfactant is a  
2 member selected from benzalkonium halides and sterylalkonium halides.

1                   **23.**     The heart valve according to claim 19, wherein said biologically  
2 active material comprises a taxane, a taxane derivative and combinations thereof.

1                   **24.**     The heart valve according to claim 19, further comprising a coating  
2 layered over said biologically active material.

1                   **25.**     The heart valve according to claim 24, wherein said coating is a  
2 member selected from bioerodable coatings, hydrogel coatings, thermoreversible  
3 coatings, bioresorbable coatings and combinations thereof.

1                   **26.**     The heart valve according to claim 1, wherein said biologically  
2 active material is covalently bonded to a reactive group located on a member selected  
3 from said sewing ring, said housing component, said valve component and combinations  
4 thereof.

1                   **27.**     The heart valve according to claim 26, wherein said biologically  
2 active material is covalently bound to said sewing ring.

1                   **28.**     The heart valve according to claim **26**, wherein said reactive group  
2 is selected from amine-containing groups, hydroxyl groups, carboxyl groups, carbonyl  
3 groups, and combinations thereof.

1                   **29.**     The heart valve according to claim **28** wherein said amine-  
2 containing groups are selected from amino groups, amido groups, urethane groups, urea  
3 groups, and combinations thereof.

1                   **30.**     The heart valve according to claim **29**, wherein said amino groups  
2 are selected from the group consisting of primary amino groups, secondary amino groups,  
3 and combinations thereof.

1                   **31.**     The heart valve according to claim **30** wherein said amino groups  
2 are derived from a nitrogen-containing gas selected from the group consisting of  
3 ammonia, organic amines, nitrous oxide, nitrogen, and combinations thereof.

1                   **32.**     The heart valve according to claim **31**, wherein said organic amines  
2 are selected from methylamine, dimethylamine, ethylamine, diethylamine, n-  
3 propylamine, allylamine, isopropylamine, n-butylamine, n-butylmethylamine, n-  
4 amylamine, n-hexylamine, 2-ethylhexylamine, ethylenediamine, 1,4-butanediamine, 1,6-  
5 hexanediamine, cyclohexylamine, N-methylcyclohexylamine, and ethyleneimine.

1                   **33.**     The heart valve according to claim **26**, wherein when said substrate  
2 is a polymer and said reactive chemical functional groups are affixed to the surface of  
3 said substrate by plasma fixation.

1                   **34.**     The heart valve according to claim **26**, wherein said biologically  
2 active material is a taxane, a taxane derivative and combinations thereof.

1                   **35.**     The heart valve according to claim **26**, further comprising a coating  
2 layered over a component that is a member selected from said sewing ring, said housing  
3 component, said valve component and combinations thereof.

1                   **36.**     The heart valve according to claim **35**, wherein said coating is a  
2 member selected from bioerodable coatings, hydrogel coatings, thermoreversible  
3 coatings, bioresorbable coatings and combinations thereof.

1                   37.     The heart valve according to claim 1, further comprising a  
2 microcapsule encapsulating said biologically active material, said microcapsule being  
3 incorporated into a component of said heart valve that is a member selected from said  
4 sewing ring, said housing component, said valve component and combinations thereof.

1                   38.     The heart valve according to claim 37, further comprising a coating  
2 layer.

1                   39.     The heart valve according to claim 38, wherein said coating is  
2 layered over said microcapsule.

1                   40.     The heart valve according to claim 38, wherein said microcapsule  
2 is embedded in said coating.

1                   41.     The heart valve according to claim 38, wherein said coating is a  
2 member selected from bioerodable coatings, hydrogel coatings, thermoreversible  
3 coatings, bioresorbable coatings and combinations thereof.

1                   42.     The heart valve according to claim 37, wherein said microcapsules  
2 are fabricated from a material that undergoes erosion in said host, thereby providing for  
3 controlled release of said encapsulated biologically active material from said  
4 microcapsules.

1                   43.     The heart valve according to claim 42, wherein said microcapsules  
2 comprise a sodium alginate envelope.

1                   44.     The heart valve according to claim 1, wherein a member selected  
2 from said sewing ring, said housing component, said valve component and combinations  
3 thereof is at least partially covered with a coating for release of at least one of said  
4 biologically active material, the coating comprising a reservoir component comprising  
5 said biologically active material.

1                   45.     The heart valve according to claim 44, wherein said coating  
2 comprises a member selected from gels, foams, suspensions, microcapsules, solid  
3 polymeric supports and fibrous structures.

1                   **46.**     The heart valve according to claim **46**, wherein said coating  
2 comprises a bioresorbable component.

1                   **47.**     The heart valve according to claim **46**, wherein the bioresorbable  
2 component is insoluble in water.

1                   **48.**     The heart valve according to claim **46**, wherein said bioresorbable  
2 component is hydrophobic.

1                   **49.**     The heart valve according to claim **46**, wherein said bioresorbable  
2 component is hydrolytically and/or enzymatically cleavable.

1                   **50.**     The heart valve according to claim **49**, wherein said bioresorbable  
2 component is selected from poly(esters), poly(hydroxy acids), poly(lactones),  
3 poly(amides), poly(ester-amides), poly (amino acids), poly(anhydrides),  
4 poly(orthoesters), poly(carbonates), poly(phosphazines), poly(phosphoesters),  
5 poly(alkylene oxides)poly(thioesters), polysaccharides, proteins and mixtures thereof.

1                   **51.**     The heart valve according to claim **50**, wherein said bioresorbable  
2 component is a poly(hydroxy) acid.

1                   **52.**     The heart valve according to claim **51**, wherein said poly(hydroxy)  
2 acid is formed from a material selected from poly(lactic) acid, poly(glycolic) acid,  
3 poly(caproic) acid, poly(butyric) acid, poly(valeric) acid and copolymers and mixtures  
4 thereof.

1                   **53.**     The heart valve according to claim **46**, wherein said bioresorbable  
2 component forms an excretable and/or metabolizable fragment.

1                   **54.**     The heart valve according to claim **45**, wherein said gel is a  
2 thermoreversible gel.

1                   **55.**     The heart valve according to claim **54**, wherein said gel comprises  
2 a member selected from pluronics, fibrin sealants, albumin, collagen, gelatin,  
3 hydroxypropylmethylcellulose, polyethylene oxide, hyaluronic acid, polysaccharides  
4 and combinations thereof.

1                   **56.**     The heart valve according to claim **45**, wherein said gel comprises  
2 a member selected from polyurethane hydrogels and polyurethane-urea hydrogels.

1                   **57.**     The heart valve according to claim **1**, comprising a first population  
2 of bioactive material having a first release rate from said heart valve, and a second  
3 bioactive material having a second release rate from said heart valve.

1                   **58.**     The heart valve according to claim **57**, wherein said first bioactive  
2 material and said second bioactive material are the same material.

1                   **59.**     The heart valve according to claim **57**, wherein said first bioactive  
2 material and said second bioactive material are different materials.

1                   **60.**     The heart valve according to claim **57**, wherein said first bioactive  
2 material is encapsulated in a microcapsule and said second bioactive material is admixed  
3 in a coating comprising said microcapsule, said coating covering at least a portion of a  
4 component that is a member selected from said sewing ring, said housing component,  
5 said valve component and combinations thereof.

1                   **61.**     A method for preventing or reducing tissue overgrowth of a  
2 prosthetic heart valve following the implantation of said heart valve into a host, said  
3 method comprising:  
4                   prior to said implantation, incorporating into a component of said heart  
5 valve a biologically active agent in an amount sufficient to prevent or retard tissue  
6 overgrowth.

1                   **62.**     A method of treating a patient requiring heart valve replacement,  
2 said method comprising:  
3                   replacing an existing valve with a prosthetic heart valve comprising a  
4 biologically active agent in an amount sufficient to prevent or retard tissue overgrowth.